

GREAT LAKES INDIAN FISH AND WILDLIFE COMMISSION

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• MEMBER TRIBES •

MICHIGAN

Bay Mills Community
Keweenaw Bay Community
Lac Vieux Desert Band

WISCONSIN

Bad River Band
Lac Courte Oreilles Band
Lac du Flambeau Band

Red Cliff Band
St. Croix Chippewa
Sokaogon Chippewa

MINNESOTA

Fond du Lac Band
Mille Lacs Band

March 19, 2010

Memorandum

To: Todd Warner and Chuck Brumleve, Keweenaw Bay Indian Community

From: John Coleman, GLIFWC Environmental Section Leader

Re: Contaminants entering the Black River watershed from the Humboldt Mill site

As we discussed on our call with the EPA on February 16th, there are concerns with the level of contamination at the Kennecott Humboldt Mill site. I understand that KBIC has requested a Preliminary Assessment under the Superfund program. As I committed to during that call, I have conducted an initial review of the Mine Permit Application (MPA) and Environmental Impact Assessment (EIA) materials submitted by Kennecott to the Michigan DNRE and available on the DNRE website.

My review focuses on materials presented in Kennecott's MPA and EIA related to surface and ground water and soil/sediment contamination in the southern portion of the Humboldt Mill and south to the Black River. This review does not look at the contamination in the flooded pit lake or the ground and surface water discharges or soil/sediment contamination to the north and into the Escanaba River. That contamination in the pit lake and to the north has been the focus of some planned efforts to control and treat discharges. The discharge of contaminants to the south appears uncontrolled and is not addressed in Kennecott's operations and closure plan for the site.

Representative figures have been attached to show the extent of the contamination but a description of the full extent of the contamination to the south is only available in the Kennecott MPA reports cited in the text below. Because of the large volume of MPA material, the dense nature of the reports and the poor quality of many of the figures and tables, this review attempts to make the most pertinent information available in a form that is more readable. Attached figures are highlighted in the text below in bold. The other figures can be found in the footnoted files, which are available at the MI-DEQ web site: http://www.michigan.gov/deq/0,1607,7-135-3311_4111_18442-205490--,00.html.

My review covers three areas of contamination:

Surface Water:

Sampling of discharges from the proposed mill site to surface waters to the south has been limited. Selected sample sites at the south edge of the site **Figure 1 (attached)** are presented in Table 1 (below).

Surface water discharges to the south have frequently been high for several parameters. These discharges have caused exceedances of in-stream standards in the Black River for some parameters. Above the mill, the Black River has a hardness of approximately 15 to 30 mg/L (site WBR-001). The Final Chronic Values (FCV, Michigan Rule 57, R 323.1057) are set out in Table 2 (below) for hardness of 15 to 50 mg/L. Values that exceed the FCV at a hardness of 20 mg/L are highlighted in Table 1. Water sampled in 1995 at a site labeled "Conv." (a ditch that conveys water from the mill area to Wetland J (**Fig.4-4, attached**)) was found to be high in several parameters. Additional water sampling conducted in 2006 and 2007 shows elevated iron, lead, manganese, and zinc in waters leaving the project area (site WLD-001) and elevated iron and manganese downstream in the Black River (site WBR-003). In 2006 and 2007 sampling, specific conductance at the upstream site (WBR-001) ranged from 49 to 74 uS/cm while both the discharge from the site (WLD-001) and the Black River downstream of the discharge (WBR-003) showed specific conductance in the range of 115 to 478 uS/cm, an indication that the site is adding substantial constituents to the Black River.

Ground Water:

Ground water sampling has been extensive within the property boundary but virtually non-existent outside the southern property boundary. MPA figures¹ and Table A-2² for Section 3.2.2 of the EIA Appendix B-1 document historical (1990s) contamination of the site up to the edge of Wetland J for many constituents. Contamination found in the 1990s is shown in MPA figures³ and includes arsenic (Fig. 3-25³), lead (Fig.3-27³), and manganese (Fig. 3-28³) among others. More recent sampling in 2006 and 2007 (Figures for EIA Appen. B-1, Section 5.3.1⁴) and Table 5-2⁵ show continued contamination up to and south of Wetland J. This continued groundwater contamination includes **manganese (Fig. 5-53, attached)**, **arsenic (Fig. 5-55, attached)**, and vanadium (Fig. 5-57⁴) as well as other constituents.

Of note is the groundwater contamination in close proximity to wells to the south of the mill. MPA site maps (**Fig.3-1, attached**) identify a potable well and a residence within 200 and 800 feet of a contaminated monitoring well, respectively. These drinking water wells are downgradient (**Fig 5-22, attached**) of monitoring wells showing contamination. There are additional residential wells at approximately 1,600 feet from contaminated site wells. To my knowledge there is no data on the water quality of these drinking water wells.

The 2006 and 2007 groundwater sampling indicate that the mill site is still contaminated by a wide variety of constituents and that the contamination extends up to, and most probably beyond, the property boundary. I was unable to find sampling on adjacent private properties.

Soils and Sediments:

The site has consistently been identified as having contaminated soil for a wide variety of constituents. In the 1990s soil levels showed high levels of antimony, arsenic, chromium, lead, manganese, and nickel among others (Table A-1⁶). Table 5-1⁵ and figures for 2006 and 2007 soil sampling⁷ and

1 Figures 3-15 to 3-32 of MPA file: KHM-MPA-04v_04_262468_7.pdf

2 Table A-2 of MPA files: KHM-MPA-05v_02_261071_7.pdf and KHM-MPA-05v_03_261072_7.pdf

3 Figures 3-25, 3-27, 3-28 of MPA file: KHM-MPA-04v_04_262468_7.pdf

4 Figures 5-47 to 5-64 of MPA file: KHM-MPA-04v_08_262472_7.pdf

5 Table 5-1 and 5-2 of MPA file: KHM-MPA-04v-02_262463_7.pdf

6 Table A-1 of MPA file: KHM-MPA-05V-01_261070_7.PDF

7 Figures 5-23 to 5-41 of MPA file: KHM-MPA-04V-07_262471_7.pdf

waterway sediments⁸ and Table F-3⁹ show sampling in 2006 and 2007 that indicates continued wide spread soil and sediment contamination by cobalt (soil Fig. 5-32⁷ & sediments Fig. 5-84⁸), **silver (Fig. 5-89, attached)**, manganese (soil Fig. 5-34⁷ & sediments Fig. 5-93⁸), antimony (soil Fig. 5-35⁷), **arsenic (Fig. 5-36, attached)**, lithium (soil Fig. 5-38⁷ & sediments Fig. 5-85⁸), and molybdenum (soil Fig. 5-40⁷). Also found near the discharge point to the Black River was 1, 2, 4 trimethylbenzene (soil Fig. 5-23⁷). The soil and waterway sediment contamination is of particular concern because it suggests an ongoing source for the contamination found in streams discharging from the site, in the Black River, and in ground water. Because the dewatered tailings ponds and ore storage pads have not been revegetated, there may be ongoing wind and erosional transport of contaminated soil to surrounding lands and waterways.

The surface water, ground water and soil/sediment contamination at the southern edge of the proposed project appear to be extensive and extend off-site. The contamination appears to extend into Wetland J and the Black River and likely is affecting nearby private properties to the south (e.g. **Figures 5-32 and 5-38, attached**). The existing documentation of contaminants in surface waters, in ground water, and in soils and sediments indicate that:

- Control of surface water discharges from the south side of the site could reduce degradation of the Black River and associated wetlands.
- The extent of contamination of ground water off-site appears to be undocumented and investigation appears justified given the level of groundwater contamination within the site.
- Site soils and stream sediments are contaminated and are a potential source for transport of contaminants off-site by wind and rain.

The extent of contamination, particularly off-site, needs to be more completely delineated in order to better understand the movement of contaminants from the site into the Black River watershed. This review covers only the southern portion of the Humboldt Mill site. It also does not include review of any materials that were not part of Kennecott's Mine Permit Application and Environmental Impact Assessment. The intent of this review is to provide, in an accessible form, initial insight into the extent of contamination at the southern edge of the Humboldt Mill site. Please contact me by phone (608-263-2873) or email (jcolemal@wisc.edu) if you would have questions or would like to discuss this review.

cc: Neil Kmiecik, GLIFWC Biological Services Director
Ann McCammon Soltis, GLIFWC Policy Analyst

⁸ Figures 5-83 to 5-89 of MPA file: KHM-MPA-04v-09_262473_7.pdf

⁹ Table F-3 of MPA file: KHM-MPA-08V-05_261129_7.pdf

Table 1. Discharge from the proposed mill site into the Black River (all in ug/L). Concentrations above the FCV at 20 mg/L hardness are in **bold**.

Site "Conv." (on-site ditch south to Wetland J [see MPA Fig.3-9])							
Event Date	Iron	Lead	Manganese	Nickel	Zinc	SC (uS/cm)	source
11/07/1995	380,000	6.0	8,300	2,300	1,400	.	Tab.A-3 MPA (KHM-MPA-05V-04_261075_7.pdf)
Site "WLD-001" (NW & SE) [MPA Fig.5-70] also labeled SW-4 [MPA Fig.3-33] (discharge under Co.Rd.601 from Wetland J)							
Event Date	Iron	Lead	Manganese	Nickel	Zinc	SC (uS/cm)	source
08/03/2006	2,190	0.15	314	0.3	4.5	178	Tab.F-2 MPA (KHM-MPA-08V-03_261124_7.pdf)
10/02/2006	2,130	0.04	835	0.3	2.0	201	Tab.F-2 MPA (KHM-MPA-08V-03_261125_7.pdf)
02/07/2007	16,000	<0.05	4,600	<0.3	3.3	291	Tab.F-2 MPA (KHM-MPA-08V-03_261125_7.pdf)
03/14/2007 (SE)	.	.	.	.	.	212	Tab.F-2 MPA (KHM-MPA-08V-03_261127_7.pdf)
04/02/2007 (SE)	8,200	1.8	1,700	2.0	360	.	Tab.F-2 MPA (KHM-MPA-08V-03_261127_7.pdf)
05/02/2007 (SE)	.	.	.	.	.	478	Tab.F-2 MPA (KHM-MPA-08V-03_261127_7.pdf)
Site "WBR-003" [MPA Fig.5-70] (downstream, off-site, Black River and Co.Rd. Fo)							
Event Date	Iron	Lead	Manganese	Nickel	Zinc	SC (uS/cm)	source
08/03/2006	10,800	0.06	1,100	1.0	5.4	187	Tab.F-2 MPA (KHM-MPA-08V-03_261124_7.pdf)
10/02/2006	3,060	0.05	159	0.7	5.2	161	Tab.F-2 MPA (KHM-MPA-08V-03_261124_7.pdf)
02/07/2007	7,200	0.22	1,200	1.9	6.4	280	Tab.F-2 MPA (KHM-MPA-08V-03_261125_7.pdf)
03/14/2007	.	.	.	.	.	155	Tab.F-2 MPA (KHM-MPA-08V-03_261127_7.pdf)
04/02/2007	2,000	0.18	260	1.3	<0.98	.	Tab.F-2 MPA (KHM-MPA-08V-03_261127_7.pdf)
05/02/2007	.	.	.	.	.	115	Tab.F-2 MPA (KHM-MPA-08V-03_261127_7.pdf)

Table 2. Final Chronic Value (FCV) for four constituents at a hardness of 15 to 50. Taken from Michigan Rule 57 (R 323.1057). The FCV for a hardness of 20 mg/L is highlighted as being the most relevant to discharges to the Black River.

	Hardness (mg/L)	Lead	Manganese	Nickel	Zinc
FCV	15	1.2	364	10.4	23.5
FCV	20	1.7	469	13.2	30.0
FCV	30	2.7	670	18.7	42.3
FCV	50	4.8	1050	28.7	65.3

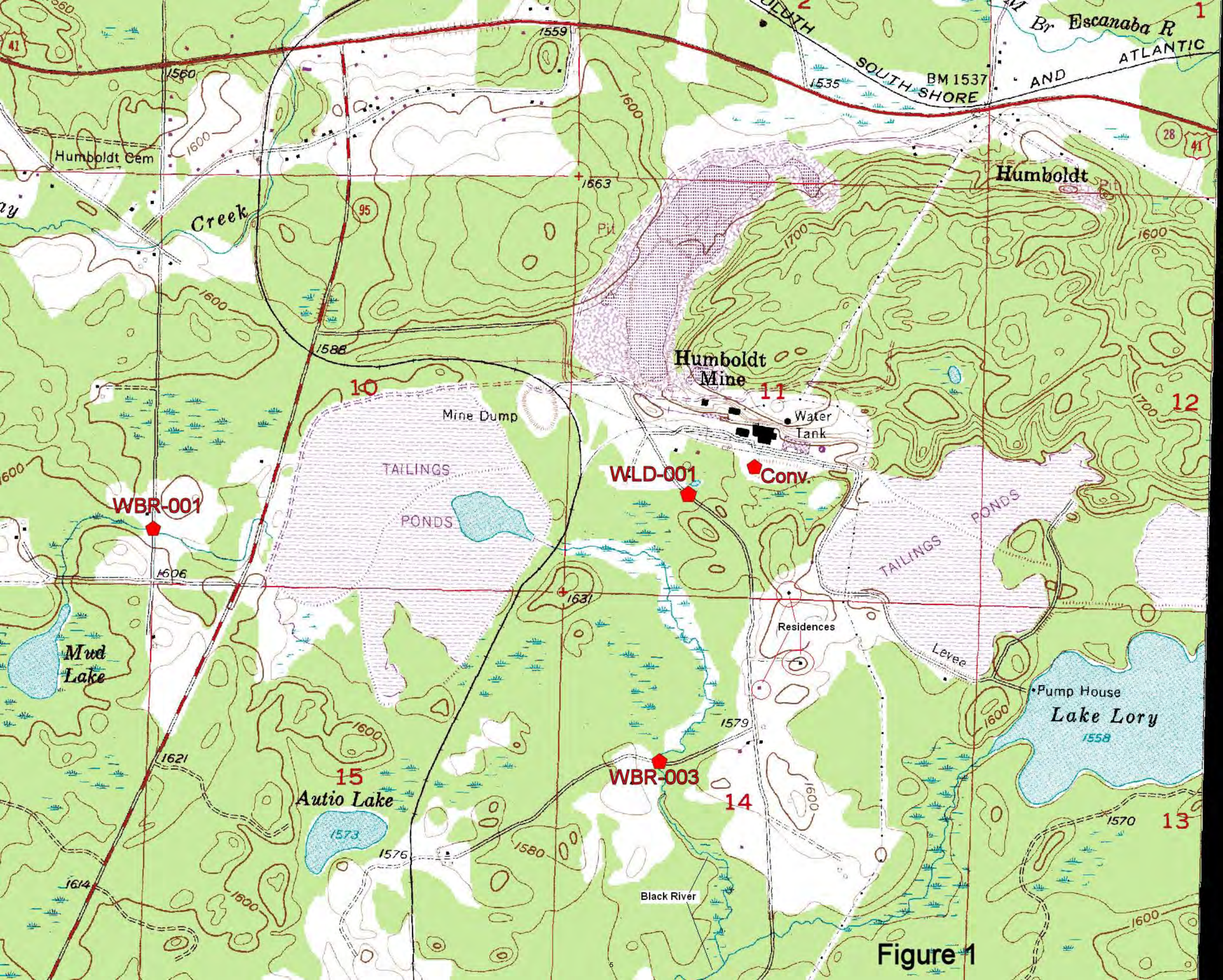
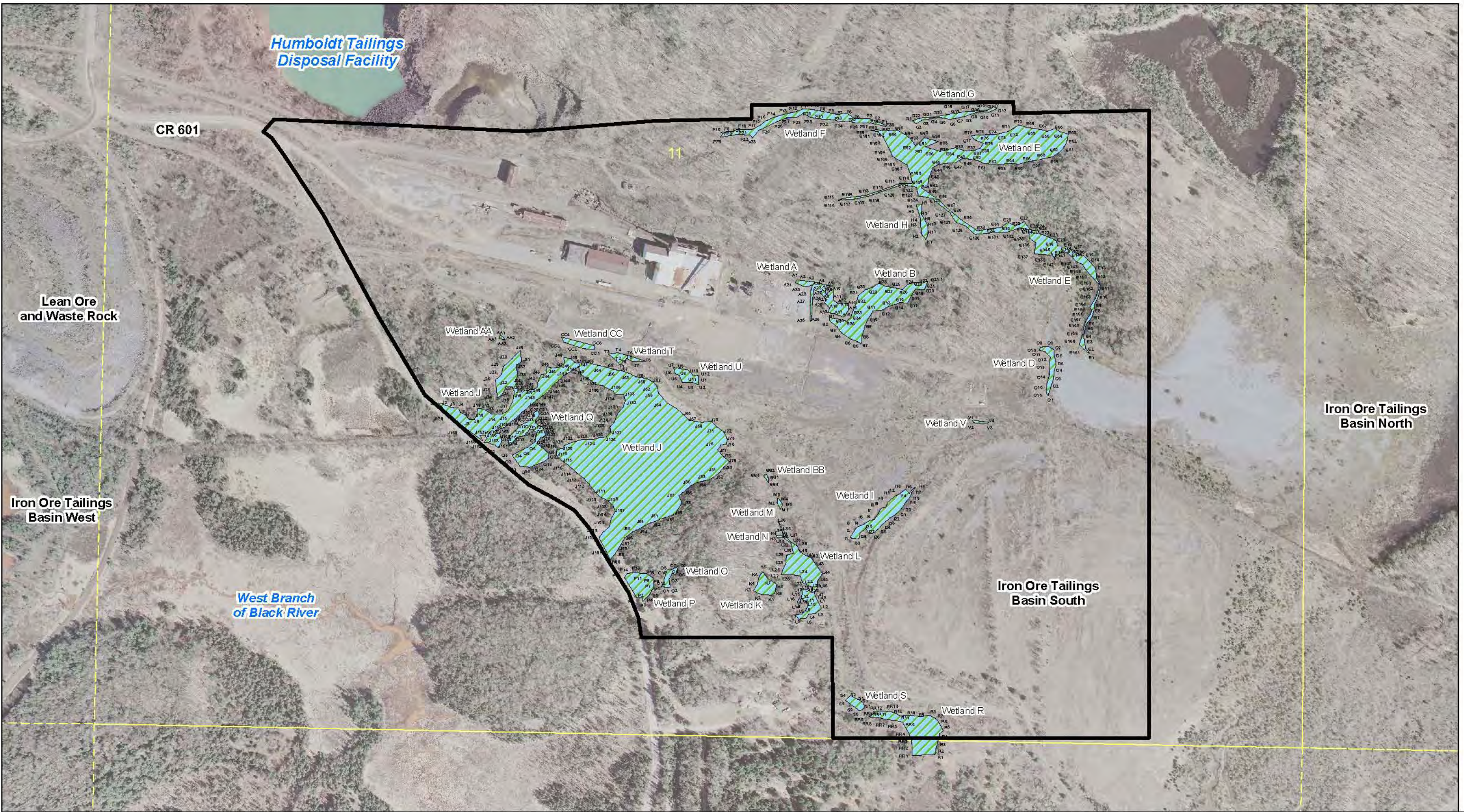


Figure 1



NOTES

- 1. Orthophotography supplied by Aero-Metric Engineering, Sheboygan, Wisconsin. Date of photography: April 27, 2006.
- 2. Horizontal datum based on NAD 83/96.
- 3. Horizontal coordinates based on Michigan State Plane North.
- 4. Site Location - Project Site within Sections 2 and 11, T47N, R29W, Humboldt Township, Marquette County, Michigan.
- 5. Wetland Boundary GPS data supplied by King & MacGregor Environmental, Inc. via email on 01/03/2007.

LEGEND

- Overall Study Area for 2006 Biological Survey
- Detailed Wetland Study Area for 2006 Biological Survey
- PLSS Sections
- R7 Wetland Boundary Flagging
- Wetlands
- Detailed Wetland Study Area



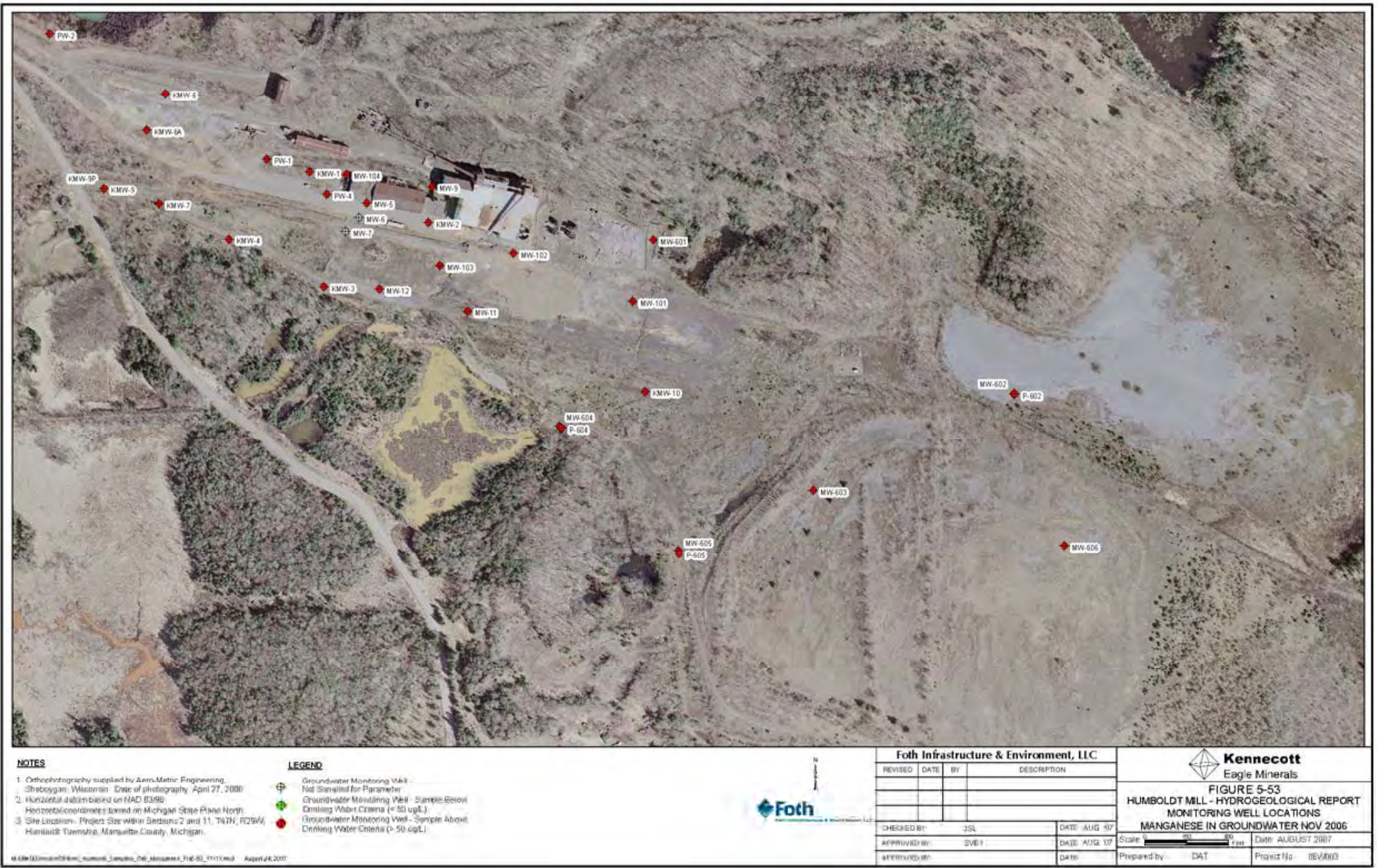
Foth Infrastructure & Environment, LLC

REVISED	DATE	BY	DESCRIPTION
CHECKED BY:		AKM	DATE: APR. '07
APPROVED BY:		SVD1	DATE: APR. '07
APPROVED BY:			DATE:



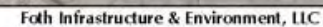
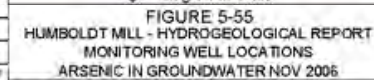
FIGURE 4-4
HUMBOLDT MILL PROJECT
WETLAND BOUNDARY FLAGGING


Scale: 0 200 400 Feet	Date: APRIL 2007
Prepared by: DAT	Project No: 06W003

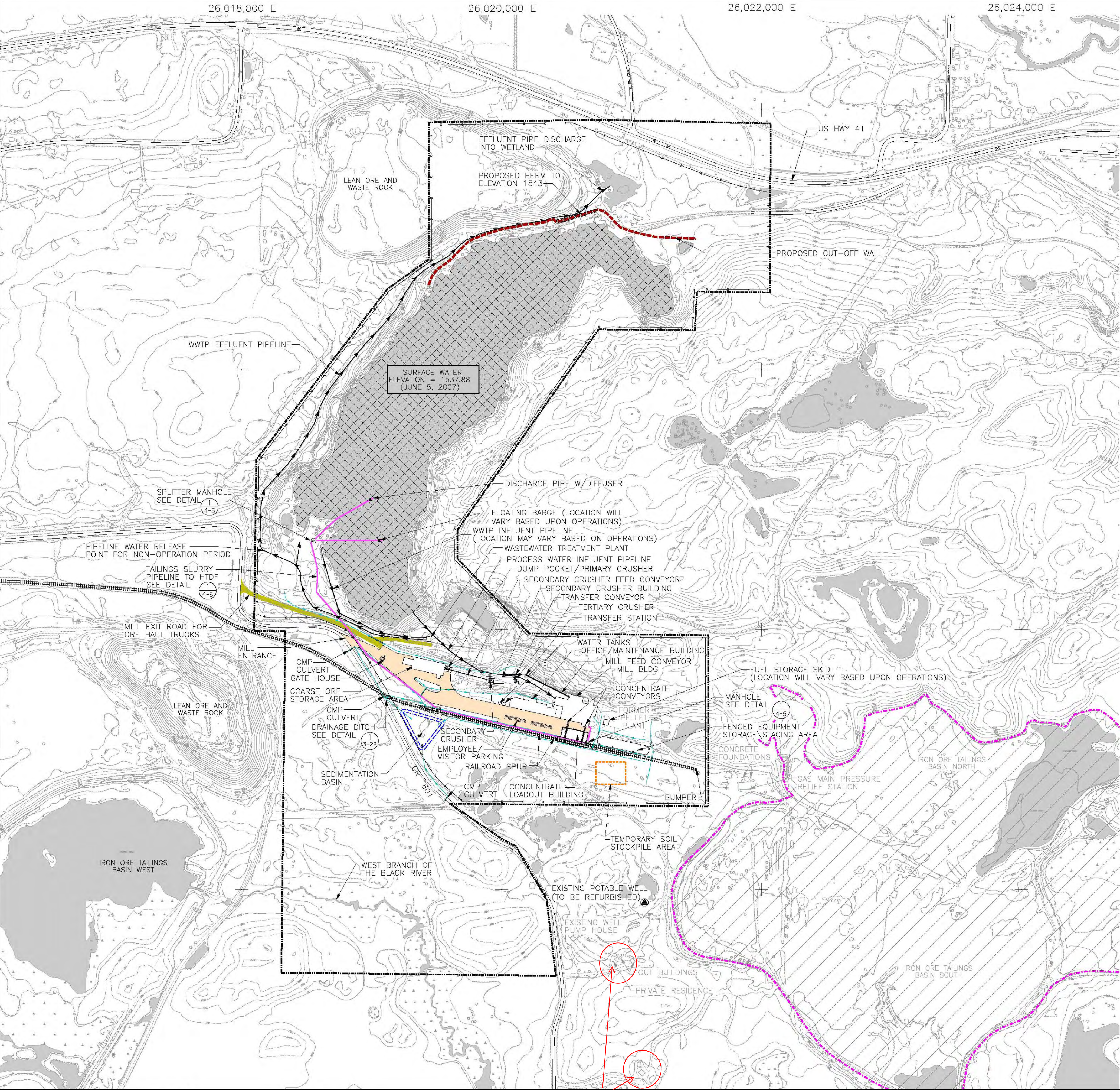


1. Orthophotography supplied by AeroMetric Engineering, Shelbyville, Michigan. Date of photography: April 27, 2006.
2. Horizontal datum based on NAD 83/96.
3. Horizontal coordinates based on Michigan State Plane North.
4. Site Location - Project Site within Sections 2 and 11, T47N, R10E, Humboldt Township, Marquette County, Michigan.

Groundwater Monitoring Well - Not Sampled for Parameter
Groundwater Monitoring Well - Sample Below Drinking Water Criteria ($< 10 \mu\text{g/L}$)
Groundwater Monitoring Well - Sample Above Drinking Water Criteria ($> 10 \mu\text{g/L}$)

[illegible]

Scale:  feet	Date: AUGUST 2007
Prepared by: DAT	Project No. 08A005



LEGEND

- EXISTING ELEV. CONTOUR IN FEET
- TREE
- TREE LINE
- BUILDING
- TRAIL
- PAVED ROAD
- UNPAVED ROAD
- STREAM/LAKE
- HUMBOLDT TAILINGS DISPOSAL FACILITY (HTDF)
- PRE-EXISTING IRON ORE TAILINGS DISPOSAL FACILITY
- KEMC PROJECT LOCATION
- GRAVEL SURFACE
- RAILROAD SPUR
- SURFACE WATER FLOW DIRECTION
- BITUMINOUS PAVED AREA
- CMP CULVERT
- FENCE
- TAILINGS SLURRY PIPELINE TO HTDF
- BERMED AREA TO ELEVATION 1543
- WWTP EFFLUENT PIPELINE (LOCATION WILL VARY BASED UPON OPERATIONS)
- WWTP INFLUENT PIPELINE (LOCATION WILL VARY BASED UPON OPERATIONS)
- PROCESS WATER INFLUENT PIPELINE (LOCATION WILL VARY BASED UPON OPERATIONS)
- PROPOSED CUT-OFF WALL

NOTES:

- TOPOGRAPHIC AND PLANIMETRIC DATA SUPPLIED BY AERO-METRIC ENGINEERING, SHEBOYGAN, WISCONSIN. DATE OF PHOTOGRAPHY: APRIL 27, 2006.
- CONTOUR INTERVAL BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988. HORIZONTAL DATUM BASED ON NAD 83/96. HORIZONTAL COORDINATES BASED ON MICHIGAN STATE PLANE.
- KEMC PROJECT LOCATION WITHIN SECTIONS 2 AND 11 T47N, R29W, HUMBOLDT TOWNSHIP, MARQUETTE COUNTY, MICHIGAN.
- CONTOUR INTERVAL SHOWN IS 10 FOOT.

Foth Infrastructure & Environment, LLC					
REVISED	DATE	BY	DESCRIPTION		
				FIGURE 3-1	
				HUMBOLDT MILL PROJECT	
				SITE DEVELOPMENT PLAN	
CHECKED BY:	JOS1	DATE:	SEPT. '08	Scale: 0 200' 400'	
APPROVED BY:	SVD1	DATE:	SEPT. '08	Date: SEPTEMBER, 2008	
APPROVED BY:		DATE:		Prepared By: JOW	Project No. 06W003

